CLAIMS

What is claimed is:

1. A method for determining a color rendering capability of at least one color imaging device with multiple color channels, the method comprising:

obtaining spectral sensitivity curves for two or more of the multiple color channels in the color imaging device; and

determining an image quality value for the color imaging device from the spectral sensitivity curves for the two or more of the multiple color channels in the color imaging device.

2. The method as set forth in claim 1 wherein determining an image quality value further comprises determining a μ-factor based on the obtained spectral sensitivity curves, wherein the determining an image quality value is based on the μ-factor and at least one other quality factor.

3. The method as set forth in claim 2 wherein the determining an image quality value is based on a relationship between the determined μ-factor and the at least one other quality factor, the image quality value being a substantial average of a minimum and a maximum value for the quality factor associated with the determined μ-factor.

4. The method as set forth in claim 2 wherein the at least one other quality factor is a delta E factor.

5. The method as set forth in claim 2 wherein the image quality value is a color difference metric value.

6. The method as set forth in claim 1 wherein determining an image quality value further comprises determining a Universal Measure of Goodness factor based on the obtained spectral sensitivity curves, wherein the determining

an image quality value is based on the Universal Measure of Goodness factor and at least one other quality factor.

7. The method as set forth in claim 6 wherein the at least one other quality factor is a delta E factor.

8. The method as set forth in claim 6 wherein the image quality value is a color quality and noise sensitivity metric value.

9. The method as set forth in claim 1 further comprising evaluating the color rendering capability of the color imaging device based on the determined image quality value.

10. The method as set forth in claim 7 wherein the evaluating further comprises comparing the image quality value of the color imaging device against an image quality standard.

11. The method as set forth in claim 7 wherein the evaluating further comprises comparing the image quality values of two or more of the color imaging devices against each other.

12. A method for designing a spectral sensitivity curve for one or more color channels of a color imaging device, the method comprising:

selecting an image quality value;

determining a spectral sensitivity curve for at least one of the color channels of the color imaging device so that the spectral sensitivity curves for each of the color channels in the color imaging device results in the image quality value.

13. The method as set forth in claim 12 further comprising obtaining a spectral sensitivity curve for at least one of the color channels of the color imaging device, wherein the determining comprises determining a spectral sensitivity curve for at least one of the other color channels of the color imaging device so

that the obtained spectral sensitivity curve with the determined spectral sensitivity curve results in the selected image quality value.

14. The method as set forth in claim 12 wherein the determining further comprises determining spectral sensitivity curves for all of the color channels of the color imaging device so that the determined spectral sensitivity curves result in the image quality value.

15. The method as set forth in claim 12 wherein the determining further comprises:

identifying one of a plurality of sets of combinations of spectral sensitivity curves based on the selected image quality value;

identifying one or more of the combinations of spectral sensitivity curves based on one or more known spectral sensitivity curves; and

selecting one of the one or more the combinations of spectral sensitivity curves based on one or more factors, wherein the determining a spectral sensitivity curve comprises obtaining the spectral sensitivity curve from the selected one of the one or more the combinations of spectral sensitivity curves.

16. The method as set forth in claim 12 wherein the determining further comprises:

identifying one of a plurality of sets of combinations of spectral sensitivity curves based on the selected image quality value;

identifying one or more of the combinations of spectral sensitivity curves based on one or more characteristics; and

selecting one of the one or more the combinations of spectral sensitivity curves based on one or more factors, wherein the determining a spectral sensitivity curve comprises obtaining the spectral sensitivity curve from the selected one of the one or more the combinations of spectral sensitivity curves.

17. The method as set forth in claim 12 wherein the image quality value is a color difference metric value.

18. The method as set forth in claim 12 wherein the image quality value is a color quality and noise sensitivity metric value.

19. A method for determining the tolerances for one or more color channels in a color imaging device, the method comprising:

obtaining a spectral sensitivity curve for at least one of the multiple color channels in the color imaging device;

obtaining an image quality value;

determining a first pair of upper and lower peak wavelength tolerances from the obtained spectral sensitivity for the at least one of the multiple color channels and the obtained image quality value; and

determining a second pair of upper and lower tolerances on the width from the obtained spectral sensitivity curve for at least one of the multiple color channels and the obtained image quality value.

20. The method as set forth in claim 19 further comprising evaluating the spectral sensitivity curve based on the first and second pair of tolerances.

21. The method as set forth in claim 19 wherein the determining a first pair and the determining a second pair comprise:

identifying one of a plurality of sets of combinations of spectral sensitivity curves based on the obtained image quality value; and

identifying one or more of the combinations of spectral sensitivity curves within the identified one of a plurality of sets of combinations of spectral sensitivity curves based on the obtained spectral sensitivity curve;

selecting one of the one or more the combinations of spectral sensitivity curves based on one or more factors, wherein the determining a first pair and the determining a second pair are determined from the selected one of the one or more the combinations of spectral sensitivity curves.

22. An imaging device analyzing system, the system comprising:

a source for spectral sensitivity curves for two or more of the multiple color channels in a color imaging device; and

an image quality processing system that determines an image quality value for the color imaging device from the spectral sensitivity curves for the two or more of the multiple color channels in the color imaging device.

23. The system as set forth in claim 22 wherein the image quality processing system further comprises a μ-factor processing system that determines a μ-factor based on the obtained spectral sensitivity curves, wherein the image quality value is based on the μ-factor and at least one other quality factor.

24. The system as set forth in claim 23 wherein the image quality processing system determines an image quality value based on a relationship between the determined μ-factor and the at least one other quality factor, the image quality value being a substantial average of a minimum and a maximum value for the quality factor associated with the determined μ-factor.

25. The system as set forth in claim 23 wherein the at least one other quality factor is a delta E factor.

26. The system as set forth in claim 26 wherein the image quality value is a color difference metric value.

27. The system as set forth in claim 22 wherein the image quality processing system determines a Universal Measure of Goodness factor based on the obtained spectral sensitivity curves, wherein the image quality value is based on the Universal Measure of Goodness factor and at least one other quality factor.

28. The system as set forth in claim 27 wherein the at least one other quality factor is a delta E factor.

29. The system as set forth in claim 27 wherein the image quality value is a color quality and noise sensitivity metric value.

30. The system as set forth in claim 22 further comprising an evaluation system that evaluates the color rendering capability of the color imaging device based on the determined image quality value.

31. The system as set forth in claim 30 wherein the evaluation system further comprises a comparison system that compares the image quality value of the color imaging device against an image quality standard.

32. The system as set forth in claim 30 wherein the evaluation system further comprises a comparison system that compares the image quality values of two or more of the color imaging devices against each other.

33. An imaging device designing system, the system comprising:

a selection system that obtains an image quality value;

a design processing system that determines a spectral sensitivity curve for at least one of the color channels of the color imaging device so that the spectral sensitivity curves for each of the color channels in the color imaging device results in the image quality value.

34. The system as set forth in claim 33 further comprising a source for a spectral sensitivity curve for at least one of the color channels of the color imaging device, wherein the determining comprises determining a spectral sensitivity curve for at least one of the other color channels of the color imaging device so that the obtained spectral sensitivity curve with the determined spectral sensitivity curve results in the selected image quality value.

35. The system as set forth in claim 33 wherein the design processing system determines spectral sensitivity curves for all of the color channels of the color imaging device so that the determined spectral sensitivity curves result in the image quality value.

36. The system as set forth in claim 33 wherein the design processing system further comprises:

an identification processing system that identifies one of a plurality of sets of combinations of spectral sensitivity curves based on the selected image quality value and identifyies one or more of the combinations of spectral sensitivity curves based on one or more known spectral sensitivity curves; and

a selection processing system that selects one of the one or more the combinations of spectral sensitivity curves based on one or more factors, wherein the design processing system obtains the spectral sensitivity curve from the selected one of the one or more the combinations of spectral sensitivity curves.

37. The system as set forth in claim 33 wherein the design processing system further comprises:

an identification processing system that identifies one of a plurality of sets of combinations of spectral sensitivity curves based on the selected image quality value and identifies one or more of the combinations of spectral sensitivity curves based on one or more characteristics; and

a selection processing system that selects one of the one or more the combinations of spectral sensitivity curves based on one or more factors, wherein the design processing system obtains the spectral sensitivity curve from the selected one of the one or more the combinations of spectral sensitivity curves.

38. The system as set forth in claim 33 wherein the image quality value is a color difference metric value.

39. The system as set forth in claim 33 wherein the image quality value is a color quality and noise sensitivity metric value.

40. A system for determining the tolerances for one or more color channels in a color imaging device, the system comprising:

a first source for a spectral sensitivity curve for at least one of the multiple color channels in the color imaging device;

a second source for an image quality value; and

a design processing system that determines a first pair of upper and lower peak wavelength tolerances from the obtained spectral sensitivity for the at

least one of the multiple color channels and the obtained image quality value and determines a second pair of upper and lower tolerances on the width from the obtained spectral sensitivity curve for at least one of the multiple color channels and the obtained image quality value.

41. The system as set forth in claim 40 further comprising an evaluation system that evaluates the spectral sensitivity curve based on the first and second pair of tolerances.

42. The system as set forth in claim 40 wherein the design processing system further comprises:

an identification processing system that identifies one of a plurality of sets of combinations of spectral sensitivity curves based on the obtained image quality value and identifies one or more of the combinations of spectral sensitivity curves within the identified one of a plurality of sets of combinations of spectral sensitivity curves based on the obtained spectral sensitivity curve; and

a selection processing system that selects one of the one or more the combinations of spectral sensitivity curves based on one or more factors, wherein the determining a first pair and the determining a second pair are determined from the selected one of the one or more the combinations of spectral sensitivity curves.